STATISTICS WORKSHOP IV

United States Department of Agriculture

Experimental Design I:

One Size
of
Experimental Unit

presented by

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Experimental Design *Introduction*

Goals

C   To *discuss* the elements of a good experimental design, *replication, randomization* and the necessity for *homogeneous experimental units.*

C   To *introduce* the taxonomy of an experimental design, the *design, treatment* and *error structures.*

C   To *introduce* frequently used *types* of *design* and *treatment structures.*

C   To *introduce* the *analysis of variance table* and the concept of *degrees of freedom.*

C   To *demonstrate* the *mechanics* of performing an analysis of variance, partitioning the *sum of squares* and *degrees of freedom.*

C   To *discuss* the *statistical interpretation of the partition of the sum of squares.*

Research Question

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Hypothesis Test or Test of Significance

Step 1. State the null and alternative hypotheses.

Step 2. Collect and assess the data.

Step 3. Generate the test statistic.

Step 4. Make a decision and state the conclusions.

How do you get from *Step 1* to *Step 2* ?

Step 1 Y **Conduct an Experiment** Y *Step 2*

An *experiment* imposes a *treatment* on an *experimental unit* in order to observe the *response variable*. The purpose of an experiment is to study whether the *treatment* causes a change in the *response variable*.

Experimental Design *Introduction*

Definitions . . .

C   An *experimental unit* (EU) is the smallest unit to which a treatment level or treatment combination can be applied.

C   A *response* or *dependent variable* is the characteristic of the EU to be measured.

C   An *explanatory* or *independent variable* attempts to explain differences in the response variable.

C   An *"uncontrolled" variable* has an affect on the response variable but has not been included in the experiment.

Experimental Design *Introduction*

Definition . . .

C   A <u>*treatment*</u> (also referred to as a *factor*) level or combination are explanatory variables assigned by the researcher to each EU.

Example: A single *treatment* with 2 *levels*.

> ### *Treatment*